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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included.

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TECHNICAL REPORT
ON
STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
STOCKING INSPECTOR I 6-14.235

B-308 or S-65

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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
STOCKING INSPECTOR I 6-14.235

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Summary

The General Aptitude Test Battery, B-1002A, was administered to 57 women employed as Stocking Inspectors I 6-14.235 at the Berkshire Knitting Mills, Reading, Pennsylvania. The criterion consisted of data obtained on a timed work sample. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes Q - Clerical Perception, K - Motor Coordination and M - Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Stocking Inspector I 6-14.235 - B-308 or S-65

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Stocking Inspector I 6-14.235.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-308 or S-65

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
Q	CB-1-B	90	Q	Part 1	90
T	CB-1-G CB-1-K	85	K	Part 8	90
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 10 of the 19 poor workers, or 53 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 53 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 31 of the 40 workers who made qualifying test scores, or 78 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Stocking Inspector I 6-14.235.

II. Sample

Sixty women employed as Stocking Inspectors I 6-14.235 at the Berkshire Knitting Mills, Reading, Pennsylvania, were tested with the General Aptitude Test Battery, B-1002A on July 27, 28 and 29, 1954. There are approximately 185 women employed by the company on this job. Because aptitude test battery B-105 had been used to select Stocking Inspectors for this company, all of those women who had been tested with B-105 were excluded from the sample. Some women who work as re-examiners or collectors were also excluded. In addition, some women were excluded because of age. The potential sample, therefore, included 76 women and 60 of these women were selected at random to be tested. After testing, three women were eliminated from the sample, one because her production average appeared to be atypical and two because they were not available at the time the criterion data were collected.

A new worker watches an experienced Inspector for several hours and then is turned over to a re-examiner who explains the job, including defects to watch for, and demonstrates the machine. The trainee then starts working, and all of her work is re-examined until she is fully trained in the work. The training requires approximately 15 weeks.

There are no age or experience requirements, but the company prefers girls with at least a 10th grade education. Applicants who qualify on aptitude test battery B-105 and are referred by the Employment Service are subsequently interviewed at the plant. All employees must pass a routine physical examination including an eye examination.

Table II shows the means, standard deviations, ranges, Pearson product-moment correlations with the criterion, and the standard errors of correlation for age, education and experience.

TABLE II
Means (M), Standard Deviations (σ), Ranges, Pearson Product-Moment Correlations with the Criterion (r), and the Standard Errors of Correlation (σ_r) for Age, Education and Experience

Stocking Inspector I 6-14.235

N = 57

	M	σ	Range	r	σ_r
Age (years)	33.6	7.0	22 - 44	-.312*	.120
Education (years)	9.5	1.7	6 - 12	.224	.126
Experience (months)	114.9	66.9	65 - 317	-.098	.131

*Significant at the .05 level

There are no significant correlations between education or experience and the criterion. There is a significant negative correlation between age and the criterion. However, this is not unexpected since the criterion involved a speed operation requiring perception and dexterity and it is likely that younger people would be more proficient at an operation involving speed.

III. Job Description

Job Title: Stocking Inspector I 6-14.235

Job Summary: Examines undyed knitted hosiery for defects due to handling and imperfection in the knitting and seaming process. Separates defective hosiery to be returned to proper department for repair.

Work Performed

Examines hosiery for defects: Opens welt of stocking and pulls stocking, seam up, over revolvable examining form; examines hose for drops or large pullers while revolving form by hand (examines for these defects before expanding form to save stocking from further imperfection); expands form with foot treadle to stretch stocking to test for weak threads and to expose defects; carefully examines stocking for defects due to handling and imperfections in the knitting and seaming process; turns form by hand so that all parts of the stocking are readily examined while the form is expanded, marks each defect with a colored soap crayon so that defect will be apparent to the repairer.

Removes stocking from form: Removes stocking from form by pushing toe end of stocking with forefinger of left hand through opening in form; pulls toe end of stocking with right hand which turns stocking to right side as it is pulled from examining form.

Segregates perfect from imperfect hose: Places perfect hose in cotton bag attached to work bench, at same time pushes lever to register number of perfect stockings examined. Places defective hosiery in the proper section of a divided rack on work table so that stocking is returned to proper department for repair (rack sections are separated by metal partitions and labelled "knitter defects," "snags-pullers," "bad seamers," etc.).

IV. Experimental Battery

All of the tests of the GATE, B-1002A, were administered to the sample group.

V. Criterion

Two types of criterion data were collected for this sample. The first consisted of on-the-job production averages and the second consisted of a timed work sample.

The production records of actual job performance were averaged for the 12-week period prior to testing. These results when correlated with the aptitude scores yielded no significant correlations. Various trial batteries were set up but no combination of aptitudes and cutting scores showed a significant relationship to the criterion. Because of this, the production records were increased to include 26 weeks. The results obtained were no better than with only 12 weeks' production records.

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The job performance production records are calculated by the company to obtain the average hourly production for each week in the period. Each girl's work is counted by the actual number of stockings examined. Work that is returned to her for not having been correctly examined is re-examined by the girl, but no credit is given for the number examined the second time. The supervisor indicated that the work is not re-examined in a uniform manner. For example, a girl who is generally believed to be a good worker may have none of her work re-examined for errors, while a girl who is thought to be a poorer worker, or who spent too much time talking to other girls, might have a very high percent of her work re-examined. It was believed that as a result of these procedures the job performance production records were not sufficiently comparable to serve as a suitable criterion for test validation. Therefore, a timed work sample was obtained for each worker in the experimental sample.

For the timed work sample the girls worked at their own machines and were supplied with sufficient work. They worked one hour and the actual number of stockings examined was recorded. All of the work of all of the girls was re-examined by the company and an error percentage was recorded. The net number of hose examined in the hour was used as the final criterion score--that is, the actual number of stockings examined minus the number of stockings which were rejected on the re-inspection. The net number of hose examined ranged from 257 to 491 with a mean of 351.6 and a standard deviation of 55.0.

The timed work sample was considered to be the best criterion available since each girl had an equal opportunity to perform, there were no interruptions, and the entire production of each woman for the one hour period was re-examined for errors.

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations, Pearson product-moment correlations with the criterion, and the standard errors of correlation for the aptitudes of the GATB.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations with the Criterion (r), and the Standard Errors of Correlation (σ_r) for the Aptitudes of the GATB

Stocking Inspector I 6-14.235

N = 57

Aptitudes	M	σ	r	σ_r
G-Intelligence	85.9	12.6	.077	.132
V-Verbal Aptitude	90.2	12.4	.191	.128
N-Numerical Aptitude	86.5	14.4	-.058	.132
S-Spatial Aptitude	85.4	15.6	.107	.131
P-Form Perception	95.2	17.6	.103	.131
Q-Clerical Perception	101.2	13.0	.302*	.120
K-Motor Coordination	107.8	14.1	.140	.130
F-Finger Dexterity	101.1	18.5	.005	.132
M-Manual Dexterity	107.1	18.7	.138	.130

* Significant at the .05 level.

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Form Perception (P) - to perceive pertinent detail while examining stockings for defects such as drops, pullers, snags, knitting and seaming defects.

Motor Coordination (K) - to coordinate eyes and hands in the pulling of stockings over form, revolving form and examining stockings at the same time.

Finger Dexterity (F) and Manual Dexterity (M) - to handle stockings, skillfully pull stockings over form, revolve form with both hands and pull stockings off the form.

The highest mean scores in decreasing order of magnitude were obtained for Aptitudes K, M, Q and F, respectively. All of the aptitudes have standard deviations of less than 20. The smallest standard deviations were obtained for Aptitudes G, V and Q.

When N = 57, correlations of .340 and .261 are significant at the .01 level and the .05 level, respectively. Aptitude Q correlates significantly with the criterion at the .05 level of confidence.

Aptitudes P, Q, K and M were considered for inclusion in the test norms on the basis of the qualitative and quantitative factors cited above. Aptitudes P, K and M appear to be important in terms of job analysis data. In addition, Aptitudes K and M have the highest mean scores for the sample. Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes P, K and M and appropriate cutting res. However, these trial norms did not yield significant results.

Although Aptitude Q was not readily apparent in the job analysis, it did show a significant correlation with the criterion at the .05 level, a relatively high mean score and a low standard deviation. Since there was no statistical evidence to warrant the inclusion of Aptitude P, and because both Aptitude P and Aptitude Q are measures of visual perception, norms which include Aptitudes Q, K and M were tried and significant results were obtained.

Although there was some qualitative evidence supporting the inclusion of Aptitude F in the norms, there did not appear to be any statistical basis to warrant further consideration of this aptitude.

The cutting score for Aptitude Q was set at one standard deviation unit below the mean and rounded to the nearest five-point score level. For Aptitudes K and M the cutting scores were set at one standard deviation unit below the mean scores and rounded to the lower adjacent five-point score levels. Setting cutting scores at these levels yielded the best selective efficiency for the norms and resulted in critical scores of 90, 90 and 85 for Aptitudes Q, K and M, respectively.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized with a critical score of 316 (stockings examined per hour), which placed one-third of the sample into the low criterion group. Those women who examined 316 stockings or more in the timed work hour were placed in the high criterion group; all others were placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes Q, K and M with critical scores of 90, 90 and 85, respectively and the criterion for Stocking Inspector I 6-14.235. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes Q, K and M with Critical Scores of 90, 90 and 85, Respectively and the Criterion for Stocking Inspector I 6-14.235

N = 57

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	31	38
Poor Workers	10	9	19
Total	17	40	57

$$r_{tet} = .56 \quad X^2 = 5.543$$

$$\sigma_{r_{tet}} = .23 \quad P/2 < .01$$

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, standard deviations, correlation with the criterion, job analysis data and their combined selective efficiency, Aptitudes Q, K, and M with minimum scores of 90, 90, and 85, respectively are recommended as B-1002 norms for the occupation of Stocking Inspector I 6-14.235. The equivalent B-1001 norms consist of Q-90, T-85 and M-90.